

Field Modification Form
Lower Passaic River Restoration Project
Remedial Investigation
Project No: 60145884



Field Modification Number: FM-12130410-1
Document (plan or SOP title and date) <i>Quality Assurance Project Plan/Field Sampling Plan Addendum. Remedial Investigation Water Column Monitoring / Small Volume Chemical Data Collection. Lower Passaic River Restoration Project. August 2011, Revision 2</i>
Activity: Perform water column particle size distribution sampling and analysis at Dundee Dam, Second, Third and Saddle Rivers, Kill Van Kull, and Arthur Kill.
<p>Proposed Modification:</p> <p>The Quality Assurance Project Plan/Field Sampling Plan Addendum (QAPP) (AECOM, 2011) is modified by this Field Modification to include collection and analysis of water samples for particle size distribution analysis at Dundee Dam, Second, Third and Saddle Rivers, and Kill Van Kull. Samples will be collected at water depths consistent with the collection of the Small Volume (SV) Chemical Water Column Monitoring (CWCM) samples:</p> <ul style="list-style-type: none"> • At non-tidal locations (Dundee Dam and tributaries): mid-depth • At tidal locations (Kill Van Kull): 3 feet below the water surface and 3 feet above the bottom, water depth permitting. <p>In addition CWCM samples collected from these locations and Arthur Kill during previous sampling programs and archived will be retrieved from the chemical laboratories (SGS Analytical Perspectives and ALS [formerly Columbia Analytical Services]) and will also be submitted for analysis of particle size distribution.</p> <p>The QAPP is modified by this Field Modification as described below:</p> <p><i>Worksheet 9 (Project Scoping Session Participants Sheet)</i> is modified as follows:</p> <p>A call was held on Friday December 14, 2012 to discuss specifics of the water column particle size distribution sampling event. In attendance were Stephanie Vaughn (United States Environmental Protection Agency [USEPA]), Robert Law (de maximis, inc. [dmi]), Scott Kirchner (CDM Smith), Frank Tsang (CDM Smith), Ed Garland (HydroQual, Inc.), Beth Buckrucker (US Army Corps of Engineers [USACE]) and Marcia Greenblatt (Integral Consulting).</p> <p>The results of this call are summarized in this Field Modification.</p> <p><i>Worksheets 10 (Problem Definition) and 11 (Project Quality Objectives/Systematic Planning Process Statements)</i> are modified as follows:</p> <p>Particle size distribution data are needed to support ongoing development of the Lower Passaic River Study Area (LPRSA)/Newark Bay (NB) Sediment Transport (ST) and Chemical Fate and Transport (CFT) models. Water samples will be collected at the proposed sampling locations during implementation of the high volume (HV) sampling event (December 2012 – January 2013) and submitted for particle size distribution analysis. These data will be used together with data from archived water samples collected during previous SV Routine and Low Flow (LF) sampling events, and analyzed for particle size distribution, to provide characterization of solids in the water column over a range of flow conditions with spatial coverage of the tributaries to the LPRSA.</p> <p>Who will use the data?</p> <p>The Cooperating Parties Group (CPG), Tierra Solutions, Inc. and USEPA will use these data for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-related assessments, including the LPRSA Risk Assessments (RAs) and Food Web Model (FWM), the LPR/NB CFT Model and other tasks associated with both the LPRSA Remedial Investigation (RI)/Feasibility</p>

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Study (FS) and the Newark Bay Study Area (NBSA) RI/FS.

What will the data be used for?

The data will be used to support the ST/CFT model specifically for:

- Characterization of the initial conditions;
- Calibration, validation and sensitivity testing of the CFT model; and,
- Development of solids loadings to the model.

What types of data are needed (matrix, target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques)?

Surface water samples collected during the December 2012 – January 2013 HV sampling event, and samples collected during previous SV Routine and LF sampling events and archived by the chemical analyses laboratories, will be analyzed by an off-site laboratory for particle size distribution. Sampling techniques will be consistent with the methods described in the QAPP. No field screening or field measurements will be performed in conjunction with this sampling (except the water column profiling identified in the QAPP).

How “good” do the data need to be in order to support the environmental decision?

The data need to be collected and analyzed in conformance with various USEPA Region 2 quality assurance guidance and manuals (<http://www.epa.gov/region2/qa/documents.htm>).

How much data are needed (number of samples for each analytical group, matrix, and concentration)?

Sample collection is planned for the LPRSA tributaries, above Dundee Dam, and Kill van Kull (boundary condition to Newark Bay). These data will be used together with archived water column samples from other SV Routine and LF CWCM events, analyzed for particle size distribution, to provide data over a range of flow conditions with spatial coverage of the tributaries to the LPRSA. A summary of the samples to be analyzed is presented below and in the attached Table 1.

Where, when, and how should the data be collected/generated?

The locations sampled will provide spatial coverage of the tributaries to the LPRSA for determination of solids loadings and transport. The following stations will be sampled during the first HV CWCM sampling event (December 2012 – January 2013):

- Dundee Dam – Provide data to estimate loadings to the model (collected mid-depth).
- Saddle River – Provide data to estimate loadings to the model (collected mid-depth).
- Second River – Provide data to estimate loadings to the model (collected mid-depth).
- Third River – Provide data to estimate loadings to the model (collected mid-depth).
- Kill van Kull – Provide data to estimate loadings/exchange with Newark Bay and for model calibration and validation (collected 3 feet below water surface and 3 feet above bottom). Collect on the incoming tide, to the extent possible.

The water samples will be collected using peristaltic pump tubing dedicated to each location or direct immersion, depending on the sampling conditions. Refer to Appendix A of the QAPP (FSP Addendum) and Appendix B (Field SOPs) for details of field procedures. At the Kill van Kull location, samples will be collected on the incoming tide, to the extent possible.

In addition to these samples collected during the first HV CWCM sampling event, archived water samples

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collected during the five previous SV Routine sampling events and the LF sampling event will also be analyzed for particle size distribution, to provide characterization of solids in the water column over a range of flow conditions.

Samples that will be submitted for particle size analyses are summarized in the attached Table 1.

Worksheet 14 (Summary of Project Tasks) is modified as follows:

Sampling Tasks: The proposed water column particle size distribution sampling will take place at Dundee Dam, Second, Third and Saddle Rivers, and Kill Van Kull. Samples will be collected from each location using peristaltic pump tubing dedicated to each location or direct immersion. At the Kill van Kull location, samples will be collected on the incoming tide, to the extent possible.

Analysis Tasks: The water samples identified in the attached Table 1 will be submitted for particle size distribution analysis.

The samples will be analyzed for particle size distribution by Particle Technology Labs via Laser Diffraction with a particle range of 0.02 μm to 2000 μm . Grain size will be reported on a volume weighted basis. Each sample will be filtered using a large size sieve to filter out worms and other detrital matter such as shells, twigs, etc. The sample will then be filtered through a 0.45 μm filter and then reconstituted to concentrate the sample. The sample will then be deflocculated by treatment with hydrogen peroxide and stirring for 5 to 7 minutes. See attached "Summary of Particle Size Distribution Procedure (Laser Diffraction)" provided by Particle Technology Labs.

Worksheet 16 (Project Schedule/Timeline Table) is modified as follows:

Collection of water samples for particle size distribution analysis will take place in December 2012 and January 2013. Analysis of these samples, as well of the archived samples, will be completed during March and April 2013. Data will then be incorporated into the LPRSA/NB ST/CFT models.

Worksheet 17 (Sampling Design and Rationale) is modified as follows:

Sampling locations were chosen to be generally consistent with locations sampled during the SV CWCM program, and to take advantage of the HV data collection effort.

Water samples will be collected from five locations for particle size distribution analysis during one event. At Dundee Dam and the Second, Third, and Saddle Rivers, a sample will be collected from mid depth. At Kill van Kull, a sample will be taken from 3 feet below the surface and 3 feet above the bottom. One field duplicate water sample will also be collected. This results in a total of 7 samples. As described in Worksheet 11, the particle size distribution results will support ongoing development of the LPRSA/NB ST/CFT models.

These data will be used together with data from the archived water samples, which will also be analyzed for particle size distribution, to provide data over the range of flow conditions represented by the water column sampling performed to date (i.e., as represented by the LF, SV and HV events) with spatial coverage of the tributaries to the LPRSA.

Worksheet 12 (Measurement Performance Criteria Table) is modified as shown in the attached Table 2.

Worksheet 18 (Sampling Locations and Methods/SOP Requirements Table) is modified as shown in the attached Table 3.

Worksheet 19 (Analytical SOP Requirements Table) is modified as shown in the attached Table 4.

Worksheet 20 (Field Quality Control Sample Summary Table) will be modified as follows:

A single field duplicate sample will be collected for water column particle size distribution analysis. No equipment rinsate blanks or performance evaluation (PE) samples will be collected in association with

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the particle size analysis. Table 5 summarizes the samples that will be collected and analyzed.

Worksheet 28 (QC Samples Table) is modified as shown in the attached Table 6.

Worksheet 30 (Analytical Services Table) will be modified as follows:

Water column particle size distribution will be analyzed on standard three week turnaround time by:

Particle Technology Labs
 555 Rogers St
 Downers Grove, IL 60515
 Aubrey, Montana
 PH: (630)969-2703 x103

Worksheet 31 (Planned Project Assessment Table) will be modified as follows:

No audits are planned for the water column particle size distribution sampling and analysis.

Worksheet 34 (Sampling and Analysis Verification (Step I) Process Table) will be modified as follows:

No EDDs will be provided for the particle size distribution analysis and no validation will be performed on this analysis. Data packages will be reviewed for completeness and adherence to the stated analytical procedures.

Worksheet 35 (Sampling and Analysis Validation (Steps IIa and IIb) Process Table) will be modified as follows:

Data validation will not be performed on the particle size distribution analysis. Custody records will be reviewed to confirm sample traceability from collection to reporting and the data reports from Particle Technology Labs will be reviewed for completeness and adherence to the stated analytical procedures.

Worksheet 36 (Sampling and Analysis Validation (Steps IIa and IIb) Summary Table) will be modified as follows:

The particle size distribution data will not be validated, but will be checked by the data users for completeness and usability.

Effective Date: April 10, 2013

Rationale: This Field Modification Form provides a formal update to the SV QAPP to incorporate scope of work agreed to in the December 14, 2012 conference call and described above.

Submitted by: Douglas E. Simmons

Date: April 10, 2013

Project QA Manager Approval: Debra L. Simmons

Date: April 10, 2013

Task Manager Approval: Douglas E. Simmons

Date: April 10, 2013

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Table 1
Samples Submitted for Analysis
Water Column Particle Size Distribution Sampling and Analysis

Station	Small Volume Routine ¹					Small Volume Low Flow ¹	High Volume ²
	Event 1 – 08/15-18/2011	Event 2 – 02/20-23/2012	Event 3 – 03/26-29/2012	Event 4 – 06/04-07/2012	Event 5 – 12/10-13/2012	Event 1 – 08/28-30/2012	Event 1 – 12/17/2012-01/09/2013
Dundee Dam	11A-CE05-T175-AS	12B-CE05-T175-AS	12D-CE05-T175-AS	12F-CE05-T175-AS	12H-CE05-T175-AS	12G-CE05-T175-AS	12J-CE05-T175-AS
Second River	11A-CE05-T2R1-AS	12B-CE05-T2R1-AS	12D-CE05-T2R1-AS	12F-CE05-T2R1-AS	12H-CE05-T2R1-AS	12G-CE05-T2R1-AS	12J-CE05-T2R1-AS
Third River	11A-CE05-T3R1-AS	12B-CE05-T3R1-AS	12D-CE05-T3R1-AS	12F-CE05-T3R1-AS	12H-CE05-T3R1-AS	12G-CE05-T3R1-AS	12J-CE05-T3R1-AS
Saddle River	11A-CE05-TSR1-AS	12B-CE05-TSR1-AS	12D-CE05-TSR1-AS	12F-CE05-TSR1-AS	12H-CE05-TSR1-AS	12G-CE05-TSR1-AS	12J-CE05-TSR1-AS
Kill Van Kull ³	N02-CE02-TKVK-AS	N03-CE02-TKVK-AS	N05-CE02-TKVK-AS	N06-CE02-TKVK-AS	N07-CE02-TKVK-AS	NA ⁵	12J-CE05-TKVK-AS
	N02-CE02-TKVK-BS	N03-CE02-TKVK-BS	N05-CE02-TKVK-BS	N06-CE02-TKVK-BS	N07-CE02-TKVK-BS		12J-CE05-TKVK-BS 12J-CE05-TKVK-BT
Arthur Kill ⁴	N02-CE02-TARK-AS	N03-CE02-TARK-AS	N05-CE02-TARK-AS	N06-CE02-TARK-AS	N07-CE02-TARK-AS	NA	NA
	N02-CE02-TARK-BS	N03-CE02-TARK-BS	N05-CE02-TARK-BS	N06-CE02-TARK-BS	N07-CE02-TARK-BS		
¹ Archived samples submitted for analysis. ² Samples collected specifically for these analyses see Table 2. ³ Two samples collected: one at 3 ft. below surface and one at 3 ft. above bottom; field duplicate from deeper sample during high volume sampling event. ⁴ Two samples collected: one at 3 ft. below surface and one at 3 ft. above bottom. ⁵ NA – Not sampled.							

Table 2
Worksheet 12 Measurement Performance Criteria Table
Water Column Particle Size Distribution Sampling and Analysis

Matrix	Water				
Analytical Group	Particle Size Measurements				
Concentration Level	Low				
Sampling Procedure	Analytical Method/SOP	DQI	Measurement Performance Criteria ¹	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
LPR-FI-04	PTL-1	Accuracy/Bias	± 3% of certified reference material range	Standard Reference Material	A
	PTL-1	Precision	RSD ≤ 15%; RSD ≤ 30% for particle sizes < 10 um	Four measurement scans per sample	A
	PTL-1	Precision	RPD ≤ 50% where particle sizes for both samples are > 10 um	Field Duplicate	S & A
	PTL-1	Completeness (Laboratory Analyses)	≥90%	Data Completeness Check	S & A

¹ Performance criteria are based on similar analyses. Natural environmental samples can exhibit significant variability and storage time prior to analysis may also result in increased variability.

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Table 3
Worksheet 18 - Sampling Locations and Methods/SOP Requirements Table
Water Column Particle Size Distribution Sampling and Analysis

Sampling Location	Location Description	Matrix	Depth Interval(s)	Sample ID	Analysis	Number Samples per Depth Interval	Sampling SOP Reference	Rationale for Sampling Location
Dundee Dam	Above Dundee Dam	Water	One: Mid-Depth	12J-CE05-T175-AS	Particle Size Distribution via Laser Diffraction	One	LPR-FI-04 LPR-FI-05	Data to support LPR/NB ST/CFT models.
Second River	Washington Avenue Bridge	Water	One: Mid-Depth	12J-CE05-T2R1-AS	Particle Size Distribution via Laser Diffraction	One	LPR-FI-04 LPR-FI-05	Data to support LPR/NB ST/CFT models
Third River	River Road	Water	One: Mid-Depth	12J-CE05-T3R1-AS	Particle Size Distribution via Laser Diffraction	One	LPR-FI-04 LPR-FI-05	Data to support LPR/NB ST/CFT models
Saddle River	Saddle River Avenue Bridge	Water	One: Mid-Depth	12J-CE05-TSR1-AS	Particle Size Distribution via Laser Diffraction	One	LPR-FI-04 LPR-FI-05	Data to support LPR/NB ST/CFT models
Kill Van Kull	Near eastern edge of Mayor Dennis P. Collins Park	Water	Two: 3 ft below surface 3 ft from bottom	12J-CE05-TKVK-AS	Particle Size Distribution via Laser Diffraction	One	LPR-FI-04 LPR-FI-05	Data to support LPR/NB ST/CFT models
				12J-CE05-TKVK-BS		One	LPR-FI-04 LPR-FI-05	

Table 4
Worksheet 19 Analytical SOP Requirements Table
Water Column Particle Size Distribution Sampling and Analysis

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference ¹	Sample Size	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/ analysis)
Water	Particle Size Distribution	Low	PTL-1	1 Liter	1 x 1L plastic or glass	4±2°Celsius (C); no chemical preservation	Not Applicable

¹ See attached “Summary of Particle Size Distribution Procedure (Laser Diffraction) prepared by Particle Technology Labs.

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Table 5
Worksheet 20 - Field Quality Control Sample Summary Table
Water Column Particle Size Distribution Sampling and Analysis

Matrix	Analytical Group	Conc. Level	Analytical and Preparation SOP Reference ^a	No. of Sampling Locations (No. of Samples)	No. of Field Duplicates	No. of Rinsate Blanks	No. of PE Samples	Total No. of Samples to Lab
Small Volume Routine Event 1								
Surface Water	Laser Diffraction	Low	PTL-1	6 (8)	0	0	0	8
Small Volume Routine Event 2								
Surface Water	Laser Diffraction	Low	PTL-1	6 (8)	0	0	0	8
Small Volume Routine Event 3								
Surface Water	Laser Diffraction	Low	PTL-1	6 (8)	0	0	0	8
Small Volume Routine Event 4								
Surface Water	Laser Diffraction	Low	PTL-1	6 (8)	0	0	0	8
Small Volume Routine Event 5								
Surface Water	Laser Diffraction	Low	PTL-1	6 (8)	0	0	0	8
Small Volume Low Flow Event 1								
Surface Water	Laser Diffraction	Low	PTL-1	4 (4)	0	0	0	4
High Volume Event 1								
Surface Water	Laser Diffraction	Low	PTL-1	6 (6)	1	0	0	7
Total Samples	Laser Diffraction	Low	PTL-1	50	1	0	0	51

^a See attached "Summary of Particle Size Distribution Procedure (Laser Diffraction) prepared by Particle Technology Labs.

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Table 6
Worksheet 28 – QC Samples Table
Water Column Particle Size Distribution Sampling and Analysis

Matrix	Water
Analytical Group^a	Particle Size Distribution Sampling and Analysis
Concentration Level	Low
Sampling SOP^b	LPR-FI-04
Analytical Method/ SOP Reference^c	PTL-1
Sampler's Name	AECOM Field Staff
Field Sampling Organization	AECOM
Analytical Organization	Particle Technology Laboratories
Number of Sample Locations	6 Locations

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria ¹
LCS	Minimum Frequency every 3 months	± 3% of the certified reference material range	Reanalyze affected samples. Service instrument	Analyst/Section Supervisor	Accuracy/Bias	± 3% of reference material range
Laboratory Replicate	4 scans/sample	RSD ≤ 15%; RSD ≤ 30% for particle sizes < 10 um	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RSD ≤15%; RSD ≤ 30% for particle sizes <10 um
Field Duplicate	1	RPD ≤50% if particle sizes are > 10 um in both samples	Evaluate during data validation. Qualify data as needed	Data Validator	Precision	RPD ≤50%

¹ Performance criteria are based on similar analyses. Natural environmental samples can exhibit significant variability and storage time prior to analysis may also result in increased variability.

PTL-1

Particle Technology Labs (PTL)

Summary of Particle Size Distribution Procedure (Laser Diffraction)

1. Each sample will be hand shaken vigorously in its original container to resuspend any particulate and thoroughly mix the suspension
2. A vacuum filtration flask device will be assembled using a 0.45 um regenerated cellulose filter. A 3" diameter, 2000 um sieve will be placed on top of the filter cup to remove any large debris such as twigs, shell fragments, etc.
3. A representative portion of the sample will be poured through the 2000 um sieve into the filter flask receiving cup. A vacuum will be pulled and the suspended particulate drawn onto the 0.45 um filter. Depending on the sample loading in each suspension, sufficient sample will be drawn down to form a filter cake which will be analyzed on a Malvern Mastersizer 2000 laser diffractor.
4. The collected damp filter cake will then be placed into a small container (plastic blood vial or small glass beaker), and approximately 15 mL of 0.2 um filtered deionized (DI) water will be added. In addition, several milliliters of hydrogen peroxide will be added to the vessel.
5. The filter and resuspension fluid will be vigorously hand shaken for a few seconds and then the covered vessel will be placed into a laboratory ultrasonic bath. The filter and resuspension media will be ultrasonicated for 5-7 minutes as directed previously in order to deflocculate/disperse the particles.
6. Once ultrasonication is completed, the vessel will be removed from the ultrasonic bath, the filter removed using tweezers, and adhered particulate rinsed back into the vessel using 0.2 um filtered DI water.
7. A drop of the sample suspension will then be viewed under a phase contrast laboratory microscope prior to analysis on the laser diffractor to evaluate the general size and dispersion of the sample.
8. The suspension will then be analyzed on the Malvern Mastersizer 2000 for particle size distribution using PTL's default instrument settings. A clean background will be taken prior to each sample analysis. The analytical range for the instrument is 0.02 – 2000 um. Results will be reported on a Volume (mass) basis.
9. The filtration flask assembly will be thoroughly rinsed between each sample and a new 0.45 um filter will be used for each sample.

The above outline gives a general overview of the analytical steps. Once analysis is initiated, minor changes may be required, but the overall approach will be the same. One area which may require discussion upon microscope evaluation is whether additional/alternate surfactants other than hydrogen peroxide may be required. However, this can be discussed and documented as a modification once analysis is initiated.